STRATEGY RESEARCH PROJECT

CREATIVE THINKING FOR STRATEGIC LEADERS

BY

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ABSTRACT

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Military and civilian strategic leaders face numerous new challenges in the global situation. These leaders must approach their duties in innovative ways. Current paradigms artificially restrict leaders to 'tried and true' approaches. We do not have a methodology to expand the strategic leader's mindset and thereby approach issues innovatively. This paper will discuss several theoretical approaches to creative thinking. Using a small sample of Army War College students, the paper also evaluates strategic leaders thought processes and examines alternative approaches to problem solving. The implications of the results are discussed in light of strategic leader responsibilities.

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CREATIVE THINKING FOR STRATEGIC LEADERS

Today's strategic leaders are faced with a myriad of unprecedented problems. The effective leader of the 21st century must be agile, resourceful and creative. Approaching problems creatively is a challenge. To do so requires that the leader be a risk taker who seeks out innovative solutions. This paper is designed to study creativity for the strategic leader, examining self-imposed limitations and barriers. By realizing how we restrict ourselves, the forward thinking, creative strategic leader can better adjust and break into new avenues for creative solutions to future problems.

What is 'creative thinking'? Dr Livia Pohlman of the University of Texas defines creativity as "putting together apparently unrelated concepts in an innovative way that is effective." The Macquarie Dictionary states that creative means "characterized by originality and expressiveness, imaginative".[1] Nobel Prize winning physician Albert Gyorgyi said creativity is simply "looking at the same thing as everyone else and thinking something different".[2] Everyone has the potential to be creative. As strategic leaders, we need to recognize opportunities to be creative and to foster creativity in our organizations.

THE NEED FOR CREATIVITY

> "The best way to get people to think out of the box is to not create the box in the first place"[3]

The backgrounds and thought processes of many senior leaders may be very similar. In the military, by the time officers have reached the senior level, they have generally the same military education, the same types of assignments, and the same levels of responsibility. Senior leaders may in fact may have been rewarded and promoted for not being risk takers, not inclined to 'rock the boat'. Each of us brings to our decision making processes, the background of our experiences, our intellect, our risk tolerance, our prejudices, and our preferences. It is through our personal prism, this view on life, that we make our decisions. Our old habits are not easy to break. We operate in a certain comfort zone given the 'type' of person we are. Through our reinforced professional experiences, we may be inclined to unconsciously *not* think creatively.

A related concept in modern psychology is that of paradigms. Garfield defines paradigms as "habitual routines that constrain individual and organizational behavior."[4] By definition then, we can see that paradigms can potentially work in negative ways. Paradigms reinforce traditional thought processes. They draw you to the acceptable and routine. This may be the

practical and appropriate approach to many problems, but will lead us 'down the same road' as we tackle new challenges

The National Security Agency (NSA) has used lateral thinking problems to keep computer systems analysts flexible and innovative in their approach to developing network attack scenarios. Among NSA's highly technical workforce there may be a temptation to routinely look to find network vulnerabilities in the same fashion. To guard against this natural tendency, computer scientists and engineers were routinely 'tested' with brainteaser questions. Some of these questions will be described later in this paper as the creative thinking survey is described. From a systemic approach, it is beneficial to look at problems in different ways. A potential adversary can attack a computer system in a number of ways. They may look for weakness in the physical security of an installation. They may look at procedural weaknesses. They may look for technical flaws in a computer's operating system, an application, or the interface between systems. An analyst cannot fixate on any particular facet of 'the system', but instead needs to generalize the system and diversify their techniques and methods of mimicking an adversary's computer attacks. Creativity is essential in imagining how an adversary could penetrate computer systems. The ideas articulated in this paper have been useful in ensuring analysts at the National Security Agency approach their work in innovative ways.

CREATIVITY IN HISTORY

"Every act of creation is first an act of destruction"

—Picasso

There have been numerous examples of innovation and creative thinking in history. From a military perspective, in World War II alone, several examples of creativity are noteworthy. The United States Army attached plows to the front of their tanks as an effective method to clear the hedgerows of Normandy. Likewise, the enemy was unable to understand the communications of Native American 'Code Talkers'; Navajo and Choctaw used their native languages to securely communicate military messages. Since only fellow tribesmen could understand their dialect, even intercepted communications were useless to the adversary. Finally, the American military used exceptional creativity in the deception campaign of the phantom army General Patton was supposedly commanding in England prior to the attack at Normandy. The deception employed by Patton was critical in persuading the Germans to believe an Allied assault was not imminent.

The results of 'creative thinking' are not always immediate nor does creative thinking always produce its intended results. Thomas Edison is credited with inventing the light bulb. He

didn't however just one day decide to invent the light bulb. He actually had 1,800 various unsuccessful experiments before arriving at the right combination of filament, gas and other components to make the bulb practical and functional. More recently, Dr. Spence Silver, an engineer with the 3M Corporation was leading a project trying to develop a stronger type of adhesive. Instead, the bond he produced was exceedingly weak. Was this a failed experiment? No, Silver had a solution looking for the right problem. Dr. Silver invented the adhesive which is now used in Post-It [tm] notes.[5]

A review of historical 'creative solutions' highlights the ingenuity frequently needed to solve many difficult situations. Additionally we see that an innovation answer may evolve over time or actually come as an unintended consequence of an experiment.

THEORIES ON CREATIVITY

There are a number of theories which articulate why we may subconsciously restrict our creative thought processes and willingly reject innovative ideas in our organizations. By analyzing these hypotheses we may be able to see ourselves in these theories, and take corrective actions to increase our creative thinking processes.

MENTAL MODELS

Peter Senge developed the concept of what he called a 'mental model'. Mental models are "deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting." Very often, we are not even consciously aware of our mental models or the effects they have on our behavior.[6]

Mental models are often subtle and unassuming. At the same time, they are very powerful because they control what we pay attention to and what information we automatically discard. Mental models tend to have us think and act in a conservative fashion. If unchallenged, this approach causes us to see only what we have always seen and will lead us to the same results.

Many innovative ideas are never implemented because they are at odds with the organization's prevailing mental model. This phenomenon could be akin to 'groupthink'. Groupthink is the phenomenon "in which group members are more interested in retaining the approval of other members rather than trying to come up with creative solutions."[7] Deeply held, yet unconsciously internalized images of what is acceptable in an organization work to inhibit organizations from breaking out from a standard way of thinking. Group pressure can restrict new and creative ideas. The rush to a decision, encouraged by groupthink, can frequently overcome the possibility of an innovative solution. An organization's mental model goes hand-

in-hand with its culture. Strategic leaders must be cognizant of their organization's mental model and guard against the organization succumbing to an inflexible routine of operation.

Nolan Bushnell, founder of the Atari computer game system and Chuck E. Cheese Pizza, tells of not letting routines imprison your thinking.[8] Roger van Oech describes this tendency of "Mental Locks" which interfere with creativity. These mental locks push us towards predictable, practical behavior. Indeed, we should be practical most of the time. We exist day-to-day by being practical. It is only by conforming to the rules of society that we are able to operate effectively in the world. When we get in our car to drive to work, the last think we should try to do is to be innovative or creative in our driving habits. The key to successful innovation is knowing when to invoke your creative capacity.

Sometimes there is a mental block against the concept of being a "creative thinker". The reluctance to espouse oneself as a creative thinker could be a backlash against the over-used phrase "out of the box" thinking. In reality everyone has the capacity and ability to be a creative thinker.

Whether we call them 'mental models', 'mental locks', or 'paradigms', these notions of preconceived thought patterns can inhibit creative approaches to problem solving. A progressive strategic leader must be aware of these pitfalls and work to ensure neither they nor their organization falls victim to the traps associated with these patterns.

RIGHT AND LEFT BRAIN THEORIES

People process information more readily in either the left or right side of their brain. Roger Sperry, who won the Nobel Prize in 1981, theorized that the brain was divided into two hemispheres. These hemispheres control fundamental styles of thinking. The left side of the brain controls our linear processing. This would include logic, numerical sequencing, reading, and mathematics. Conversely, the right side of our brain controls the non-verbal processes. These processes would include visual processing, ambiguity, imagination, and creativity. [9]

Each of us certainly conducts both analytical (reasoned, literal, linear) as well as abstract (symbolic, non-verbal) activities. Much literature suggests that we have a preference to one style. Our preference determines which hemisphere of the brain we prefer to work with. Our education system emphasizes the linear. The three R's (reading, writing, 'rithmetic) are the foundation of elementary education. This is how most of us were educated. If we are ingrained to approach problems in a linear fashion, no doubt we will continue that strategy into adulthood. It's important to note that, similar to the Myers Briggs Type Indicator, these hemispheres are not absolute controlling dominants, they are only preferences. As such these preferences ebb and

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flow over time. Each of us deals with both hemispheres of our brains continually. Neither side is 'correct'.

Realizing that we do have natural preferences, the task at hand is to recognize our individual preferences, and adjust to ensure we utilize a 'whole mind' approach to our actions. If the right brain is in fact the 'creative' side, we must foster that hemisphere in conjunction with the linear left to rationally be creative.

GROUP AND PERSONAL CREATIVITY

Frequently, organizations look to 'team' approaches to creatively solve problems. Whether called Tiger Teams, Process Action Teams, or Think Tanks, the underlying presumption with this approach is that "many heads are better than one". In fact, creative solutions are often hampered by teams – or ill-formed teams. Creativity is born in the mind of one individual. It is from a single mind that the inspiration of creativity flows.[10]

Teams can be successful in creative efforts, but there are limitations to having teams solve problems in a creative fashion. There are several conditions which senior leaders can employ to help team creativity. Important considerations include the size of the group, personalities involved, leadership, and variety of team members' backgrounds. Research has shown that five to six members is an optimal number for a team. With this size, internal communications remains easy and group dynamics manageable. If a group becomes too large it can become unwieldy and bureaucratic. Individual members can feel 'lost' with a large group. If a group is too small there may be rivalry and turf battles.[11]

Two different approaches can be implemented to escape our personal paradigms and foster creative thinking. A conservative 'paradigm preserving' approach follows a moderate, incremental path. Paradigm preserving strategies are steady evolutionary ideas that work to adapt the existing modus operandi. Essentially, the approach is to change, but not 'rock the boat' too much.[12]

A radical, 'paradigm modifying' approach looks to be revolutionary. Paradigm modifying strategies are radical. They look to analyze problems with no pre-conceived notions or rules. Paradigm modifying ideas are truly paradigm busting techniques that will likely cause discomfort to organizational leadership.[13] To truly have a 'paradigm shift' we must be willing to 'unlearn' our preconceived notions about the way we think of problem solving.

DEVELOPING CREATIVITY

How do we master creativity? The fundamental step in developing an individual's creativity is to shatter the notion that an individual isn't or can't be creative. Von Oech believes it

is an attitude. He said that knowledge alone will not make a person creative. Sometimes we miss the opportunities laid out in front of us.[14]

It's been said that failure is the gateway to innovation.[15] Individual creativity can be developed but it requires patience and the right attitude. Creativity can be an evolutionary process; there isn't usually a light bulb involved. As was previously mentioned, Edison had to have great patience to overcome 1.800 failures before eventually succeeding with his light bulb.

To be creative we need to expand our area of interest beyond our usual discipline. The director of Neuroscience at Johns Hopkins University, Solomon Snyder has who over fifty seven scientific awards for his research in brain chemistry said that to innovate he tries to 'stop acting like a scientist".[16] He built a network of friends who are far removed from his work. Detaching ourselves from the routine associated with our workplace activity enables us to better bring in differing perspectives into out problem solving process.[17] In broadening ourselves beyond our normal workplace associates and structure, we can be more effective in breaking our ingrained routines.

We need to be attuned to our environment. The best way to explore new solutions may be to not limit ourselves to our routine way of thinking. Take for example the case of George de Mestral, a Swiss mountaineer and inventor. In the summer of 1948, he had just returned from a hike with his dog. He observed that both his pant legs and the dog were covered with burrs. Struck by nature's ability to have the irritating burrs stick to his clothing, he examined the burrs under a microscope. He noticed the small hooks that enabled the seed-bearing burr to cling to the tiny loops in the fabric of his pants. With this hook and loop inspiration, he proceeded to invent what he hoped would "rival the zipper in its ability to fasten". Indeed he did leave his mark on the world with the invention of Velcro.[18]

TESTING FOR CREATIVITY

'Lateral thinking' problems are pattern sequences or stories which have a peculiar twist. The solution to the problem is generally simple, yet unusual. The lateral thinking problem requires an innovative or sometimes very literal approach to solve. By posing this type of problem, the reader needs to modify their routine thought process in order to successfully solve the problem

A series of 'lateral thinking' problems was used to analyze the concept of creativity. Initially a set of 16 questions was given to a group of senior leaders at the U.S. Army War College. Although these puzzles can be divided into categories for later analysis, they were not grouped when the survey was administered. In examining the questions by category (after the

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fact) we can see the reasons that people are either successful or fail to get the 'correct' solution to the survey.

Correctly answering these questions requires the reader to have the flexibility to deviate from their standard paradigm and look at the problems in a different way. If the reader passively uses their standard mental model to examine the question, they will either say that there is no answer or tailor their own logic to determine an answer.

The initial Creative Thinking Survey is shown in Table 1.

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1. A man is born in 1940 and dies in 1985 at the age of 65. How can that be?

2. What is the next letter in the sequence: R O Y G B I ____?

3. A cowboy rides into town on Friday, stays five days, and rides out of town on Friday. How can that be?

4. You receive a lovely birthday cake and must cut it into eight equal pieces while making only three cuts. Is this possible

5. What is the next number in the sequence: 2, 4, 8, 16, 32, 64, _____?

6. What word does every Harvard graduate pronounce wrong?

7. What is the next number in the sequence: 2, 3, 5, 7, 11, __?

8. What is the next letter in the sequence: O, T, T, F, F, S, S, _____?

9. Two fathers and two sons plan a day of fishing. They rent a row boat which has a capacity for only three people, yet they have no problem all enjoying their day in the boat. How is this possible?

10. A group of children rake leaves all day. They have seven piles of leaves in the front yard, and five piles of leaves in the back yard. When combined, how many piles of leaves do they have?

11. You have a 12 inch log. If it takes 1 minute to make a cut, how long will it take you to cut the wood into 12 equal pieces?

12. What is the next in the pattern: MY, DEAR, AUNT, _____

13. What is next in the pattern: White, Yellow, Orange, Green

14. What is next in the pattern: Captain, Major, Lieutenant Colonel, _____

15. If a doctor gives you three pills and tells you to take one pill every half hour, how long will they last?

16. What is next in the sequence: 10, 4, 7, 11, _____?

       A) 16   B) 20   C) 5   D) 19

       Choose answer A B C or D

       What is the pattern?

TABLE 1. CREATIVE THINKING SURVEY # 1

RESULTS OF CREATIVE TESTING

The survey was given to 16 U.S. Army War College students and faculty members. In general, only 25 % of the respondents correctly answered at least half the questions. Individual respondents answered as few as four and as many as 14 of the 16 questions correctly. An analysis of the survey reveals a potential gap in individual creativity among the individual respondents as well as trends within the group. I've identified five distinct areas for failure in a set of 16 problems. These areas are similar to van Oech's "Mental Locks" and William Altier's 'Barriers to Creativity'.

The first cause for failure is <u>assuming that there was no correct solution</u>. Many highly educated, intelligent senior leaders get impatient when the answer to a problem is not immediately evident to them. They may be used to being 'right' for 20 or more years and if they don't see the obvious answer they may panic. This tendency should be moderated. In a complex world there may be many choices and frequently no obvious solution. The answer to this dilemma may be to delegate the detailed decisions and wait for an expert recommendation.

Question 4 on the survey asked to "Cut a cake into eight equal pieces making only three cuts". Many people thought that this was impossible. Only four individuals answered this correctly. The rationale to solve the problem states that after making two cuts (netting four pieces) that the final cut would result in six pieces. The thought process used was self-restrictive. Many artificially limited themselves to all cuts being in the same plane. The analysis in this problem necessary to determine the correct answer involves first visualizing the cake in three dimensions. With this idea in mind, you can then proceed to see that the correct solution had two vertical cuts (making four equal pieces), then a third horizontal cut, leaving eight pieces.

Question 9 stated: "Two fathers and two sons plan a day of fishing. They rent a rowboat which has a capacity for only three people, yet they have no problem all enjoying their day in the boat. How is this possible?"

The normal reaction to this puzzle was that there were four people, so fitting them in a boat for three was impossible. The lateral thinking required to solve this problem is one that should actually be familiar to senior government leaders – someone must be dual-hatted. Four respondents did correctly calculate that this was a possible scenario. There were only three individuals: a son, a father, and a grandfather. The father had the dual role of both father and son.

A second cause for failure was <u>incorrectly interpreting the problem</u>. This was the situation where people tend to interpret data in context in a routine way, when the 'twist' to the problem was that the information could have been interpreted in an alternative way. Readers tend to stay

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within their paradigm of thought, within the generally accepted and expected connotation of words. To solve this type of problem the reader has to ask themselves "Is there another way I can look at this problem ... could we look at through another prism?" Examining the problem from alternative angles is necessary to solve this class of problems.

Question #1 stated: A man is born in 1940 and dies in 1985 at the age of 65. How can that be?

In this problem, the reader naturally assumes that the person was born in the year 1940 and died in the year 1985 (45 years later). Mathematically, the person would have been 45 years old. Frequently, respondents thought that leap year was involved. This is reasonable since that is the paradigm of thought that people are exposed to but doesn't account for the mathematical discrepancy. Another common answer was to say that the individual was a Christian and was "born again". This answer could be considered correct to the extent that those with this response re-interpreted the question by asking themselves what it means to "be born", i.e. "born again". Operating within the paradigm of 1940 and 1985 being years, these respondents stretched their normal thought process to obtain a plausible solution.

The 'lateral thinking' solution can only be deduced by realizing that 1940 and 1980 can mean other than years. The problem stated the person was "born in" 1940. In this example if they were interpreted as hospital room numbers, it doesn't matter the year involved, a person could reasonably die at age 65. Only one individual gave the correct response. Interestingly, six people did provide alternative answers. The alternative answers used the born-again logic. This question by far generated the greatest number of 'creative' solutions.

Question #3 stated: A cowboy rides into town on Friday, stays five days, and rides out of town on Friday. How can that be?

In this problem, the reader assumes that Friday is the day of the week that the cowboy arrives in town. Likewise, he rides out of town on Friday (the day of the week).

The problem states that the cowboy "rides into town on Friday". The correct answer to this problem is that Friday is not the day of the week, but it is the name of the horse that the cowboy rode. So it really doesn't matter what day the cowboy rode into and out of town, he simply rode the same horse. Only two individuals provided the correct response to this question.

Question #6 stated: What word does every Harvard graduate pronounce wrong? This puzzle is actually better suited to be given verbally, but the written version accomplishes the same result. With this problem, the reader / listener keys in on the slant of the question; the fact that it is about someone from Harvard. Presuming a Boston accent, the reader typically responds with 'car', 'park', 'any word ending with r". The misinterpretation of the question by the

reader lies in the assumption that the question is asking for "What word does every Harvard graduate pronounce incorrectly?" Other individuals responded with 'Harvard' or 'Yale'.

What word does every Harvard graduate pronounce wrong? The correct answer to the question is "wrong". Every Harvard graduate pronounces the word "w-r-on-g" as wrong. In fact every Yale, Stanford, and U.S. Army War College graduate pronounces it 'wrong' as well. Three individuals correctly answered this question.

A third reason people fail to correctly respond to the lateral thinking problem was inattention to detail.

Question #10 stated: "A group of children rake leaves all day. They have seven piles of leaves in the front yard and five piles of leaves in the back yard. When combined, how many piles of leaves do they have?"

This problem is amazingly simple, yet some respondents failed to correctly solve the problem. Of all the 'trick' questions in survey, this question generated the most correct responses. Thirteen people answered the question. Obviously, seven plus five is twelve. However, when you combine piles, they loose their individual integrity and become one (big) pile.

Question # 11 stated: "You have a 12 inch piece of wood. If it takes 1 minute to make a cut, how long will it take you to cut the wood into 12 equal pieces?

This question leads some people to jump to the conclusion that if you want 12 pieces, you need 12 cuts. In fact, you need one less cut. For example if you need to cut a log in half, cut it into two pieces, you need only make one cut. So with the wood to be cut into 12 pieces, you would need to make only 11 cuts – taking 11 minutes. Eleven of the sixteen respondents correctly answered this question.

A fourth reason for incorrect responses was lack of exposure to the proper environment. This explanation was reinforced by two questions. One question, dealing with military grade structure, was in line with what every military serviceman would know, another question was not.

Problem # 13 asked: "What is next in the pattern: White, Yellow, Orange, Green,

_____ "

The correct answer to this pattern is "blue". To many, this would appear as a random color, but to those who study Karate, they would know that this is the belt progression (followed by: purple, brown, red, red & black, white & black, black). If you were not familiar with Karate, if this was not part of your thought process, there is no way that you would have been able to

solve the problem. Ten people did correctly identify 'blue' as the next color; however, several admitted that they just guessed the answer.

Question # 2 states: "What is the next letter in the sequence:

R O Y G B I ____ ". This problem reverts to the elementary school technique of remembering the colors of the rainbow. Red, Orange, Yellow, Green, Blue, Indigo, Violet is extensively taught as a memory technique to memorize the colors of the rainbow. Only three of the sixteen respondents correctly identified V as the answer.

Question #14 had a predictably different response. This question asked: "What is next in the pattern: Captain, Major, Lieutenant Colonel, _____"

While one person responded with 'Retirement', all sixteen respondents answered with the correct answer 'Colonel'. This pattern was well within the paradigm of senior military leader's regular thought process. If this pattern were given to others outside the military, we could expect a lesser response.

A final and most telling reason for individuals not able to correctly choose the next item in a sequence complements the previous reason. A slightly varying reason is <u>inability to recognize the pattern</u>. This inability goes beyond the previous knowledge or familiarity concept. The reader cannot be 'locked into' a mindset, but must again be willing to consider alternative approaches.

These failures were a result of situations where the person was boxed into their own self-limiting thought pattern. This is the key example of breaking into a new paradigm, rather than following the 'routine' way of solving problems.

Question # 8 stated: "What is the next letter in the sequence: O, T, T, F, F, S, S, _____"

This is an example of taking a very familiar pattern and posing it in a non-traditional format. The initial thought process to analyze the sequence is to try to calculate the number of letters between the characters. The repetition of T, F and S compounds that analysis. If the sequence had been written as One, Two, Three, Four, Five, Six, Seven; the obvious next element would be Eight. Since the sequence involved the first letter of each number (spelled out) the next character is E. Only one person correctly identified the pattern and answered correctly.

Question #16 was perhaps the most non-traditional of the sequencing puzzles. This question stated" What is next in the sequence: 10, 4, 7, 11, ___" This problem then listed four possible choices: 16, 20, 5 or 19. Within this 'number sequencing' problem, the natural inclination is look for the mathematical relationships among the values. In fact this is in particular the type of pattern recognition that we are taught in elementary school. Left brain oriented

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people immediately begin to start with the 10 to 4 is 'subtract 6', the 4 to 7 is 'add 3, then 7 to eleven is 'add 4'. With this strategy, the solution will not be solved.

Examining the problem under an alternative viewpoint would re-look the sequence as "ten four seven eleven". Considering the available possibilities: sixteen twenty five nineteen, the pattern can be revealed that the sequence is actually that each successive element has one more letter. So the solution to the problem is sixteen (16) because it has seven characters. This problem is probably the most difficult of the survey. To correctly deduce the pattern requires exceptional paradigm busting. No respondents identified this pattern.

There were several examples where the problems were solved correctly. When we are operating in familiar territory, solving problems is relatively easy. When we are in our comfort zone, dealing with familiar problems, we can solve them. Some numerical sequencing problems were solved correctly. Two questions in particular were within the routine and expected paradigms. These problems were rather straightforward mathematical problems that nearly all respondents correctly answered.

Problem # 7 stated" What is the next number in the sequence: 2, 3, 5, 7, and 11, ____ " Many realized that this is a list of the prime numbers (Numbers that are have no factors other than the number itself and one). The correct number is 13. Surprisingly, only seven respondents correctly identified the mathematical pattern.

A second problem, # 5, was also a mathematical sequence that was correctly answered by all 16 respondents. Question #5 stated: "What is the next number in the sequence: 2, 4, 8, 16, 32, 64, ____". Everyone recognized that each successive number in the sequence doubles the previous number. In other words, raising the next number by a power of two. The correct answer to this question is 128.

To summarize survey # 1, we can conclude that individuals failed to correctly answer the lateral thinking problems for a variety of factors that include: 1.) assuming there is no correct solution (it's too hard). I've actually heard that excuse used by senior managers; 2) incorrectly interpreting the problem; 3) inattention to detail; 4) lack of exposure to the proper environment, not having the necessary background or technical knowledge, through no fault of the individual 5) inability to recognize the pattern, or the person recognized the pattern but may have been hurried, pressured by a group or senior individual to rush to a decision based on an unrealistic time constraint.

Some questions were answered correctly by the large majority of the group. Primarily this was because the individuals were very familiar with the question and did not have to spend a great deal of time analyzing it. Military officers immediately knew the 'next ' rank, but a different

group of equally intelligent individuals, perhaps a group of business executives not familiar with the military, might have no idea what the next military rank was. Conversely, the military officers generally did not know the next color in the rank sequence of karate belt progression, but a group of ten year old karate students would know the sequence because it was within their sphere of awareness.

TEACHING CREATIVE THINKING

Can we learn to be creative? It depends upon what you mean by the word learn. Some authors have suggested that you cannot teach creativity.[19] This is similar to the idea that you cannot teach leadership. But creativity, like leadership, is a concept that can be fostered, groomed and developed. We will attempt to educate the reader on how they can become a more creative leader by recognizing their limitations and looking for the ways that they can enable creativity in their own problem solving and that of their organizations.

Since a large majority of respondents to the creativity survey did not answer the lateral thinking problems correctly, we can explore the strategy of 'teaching' to think creatively. Our hypothesis is that we can expose individuals to our previous lateral thinking problems and solutions, make them aware of their limitations, and point out the need to study the details and thereby obtain a greater success rate with a re-test. After completing the first survey, each individual was given the 'correct' answer set. Fourteen of the original sixteen respondents subsequently completed survey # 2. After seeing the innovative answers to the first series of questions, the respondents should, theoretically, be more creative in their answers.

The creative thinking survey number two consisted of eight questions, equal in complexity to the initial survey. The questions were aimed at generating correct responses since the only individuals to receive the second survey would be Army War College personnel who had seen the solutions to the first survey. Fourteen individuals completed survey # 2.

The second Creative Thinking Survey is shown in Table 2.

1. What is the next letter in the sequence: S, M, T, W, T, F, _____?
2. What is the next letter in the sequence: J, F, M, A, M, J, _____
3. A father and son go hiking in the rugged mountains. They both take a terrible fall in which the father is instantly killed. The son is rushed to the hospital where an elderly surgeon takes one look at the patient and says "I cannot operate on the boy, he is my son"
    How can that be?
4. How much dirt is in a hole measuring three meters by five meters which is two meters deep?
5. A woman from New York married ten different men from that city, yet she did not break any laws. None of the men died, and she never divorced. How was this possible?
6. A jumbo jet, carrying a mix of European citizens crashes on the U.S. – Canadian border, tragically half the passengers die in the mishap. Where will they bury the survivors?
7. Which is correct: the yolk is white or the yolk are white?
8. How far can a dog run into the woods?

TABLE 2 CREATIVE THINKING SURVEY # 2

ANALSIS OF RE-TEST FOR CREATIVITY

Students greatly improved their scores in the second creative thinking survey. All students who completed the second survey were previously given the correct answers to the first set of questions. Armed with this information, the students were able to acknowledge that there were alternative approaches to the questions. Ten of fourteen (71 percent) respondents correctly answered or provided innovative answers to 50 % of the problems. This compares to seven of 16 (44 %) for the first survey.

The questions in the second test fell into general themes, similar to the first survey. The questions may be characterized as: patterns, attention to detail, interpreting correctly, and assumptions.

The first two questions are pattern recognition. The first question asked to complete the pattern: S, M, T, W, T, F, ___. The sequence is simply the first letters of the days of the week. So the last letter is S for Saturday. All 14 respondents successfully analyzed the pattern and provided the correct response. Likewise, the second question deals with a very common lexicon. The letter sequence: J, F, M, A, M, J, ____ represents the first letters of the months of

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the year. The letter J would follow the pattern of January, February .... July. Thirteen respondents provided the correct response. In total, respondents successfully answered 96 percent of the cumulative pattern recognition questions.

Question three involves assumptions. The reader instinctively thinks of the "elderly surgeon" as the father of the injured boy. Instead the correct answer to the problem is that the surgeon is the boy's mother. While only five individuals deduced that the surgeon was the mother, five other innovative answers were provided. In summary, 71 percent of the "assumption" question was answered correctly or innovatively.

Question four involves attention to detail. The reader might initially calculate the volume of the hole as 3 X 5 X 2 and respond that the answer is 30. Upon careful analysis, the reader should realize that the question specifically asks for the amount of dirt in the hole. Since the hole itself is empty, the correct response is that there is no dirt in the hole. Ten respondents successfully answered the question.

Question five deals with assumptions and the interpretation to the word "married". While married can mean to be married oneself, it can also mean to perform a marriage ceremony. The correct interpretation to this question is that the woman is a minister, and she has married ten couples (ten men and their ten wives). Seven of the fourteen respondents figured out the correct solution to this problem, one individual provided an innovative answer.

Question six deals with attention to detail. In looking at exactly what the question asked it stated "Where would they bury the survivors?" Regardless of national origin, or whether they were on the U.S. or Canadian sides of the border, survivors are not buried anywhere because they are alive. Ten of the fourteen respondents correctly stated that survivors would not be buried.

Question seven asks for which of two statements are true. The assumption is that one or the other statements is true. The reader may believe that this is a subject – verb agreement question. In fact the trick to the question is that neither statement is true because the yolk of an egg is yellow, not white. Eight people correctly answered this question.

The final question to survey two asks how far a dog can run into the woods. The answer to the question can be determined by interpreting the word "into". How far can he go into the woods: half-way. When the dog reaches the mid-point in the woods he would actually be then running out of the woods. While only one person answered with the pre-determined correct answer, an impressive seven others provided innovative solutions to the question

CONCLUSIONS

After reviewing the questions, one individual indicated "These questions are easy". In fact they are nearly identical. The questions appeared easier because the respondent was more aware of the possibilities of alternative, creative answers.

When students were exposed to the alternative answers, they were more inclined to look for less conventional strategies of solving the problems. Empowered with the 'OK' to think unconventionally, they provided more 'correct' answers, and more innovative 'incorrect' answers.

GROUP ANALYSIS

As previously stated, the second Creative Thinking survey was completed by 14 of the original 16 students at the Army War College. All students previously received the answer key to the first survey. All students participated in the first survey. The results of the second test were significantly improved from the results of the initial test. While the second test questions were similar in difficulty, respondents had greatly improved results.

Comparing the two survey results as group responses we see very positive trends. In survey # 1, only 33 percent of creative thinking problems (5 of 15 questions) were answered correctly by half or more of the respondents. In survey # 2, with virtually the same respondents, 75 percent of the problems (6 of 8 questions) were answered correctly by half or more of the respondents. Adjusting our perspective to review the respondents who either answered correctly or provided a creative response the results are even more dramatic. While the same 33 percent were positive to the correct / innovative analysis, fully 100 percent of the questions in survey # 2 were answered correctly or in an innovative manner by the respondents.

With this definitive analysis of the collective group responses, we can conclude that exposure to the first survey, and providing the 'creative thinking' answers caused the respondents to dramatically increase their creativity with respect to survey # 2.

WAY AHEAD FOR STRATEGIC LEADERS

After completing both creative thinking surveys, a strategic leader will see where they failed to correctly answer certain questions. By reviewing the characteristics of the questions, they will understand where they did not adequately analyze the specifics of the question. The strategic leader should now be comfortable realizing where they limited themselves. The first step in modifying behavior is in realizing that creative restrictions are self-imposed. Correcting behavior is an educational process. Where does education take place? For the military, 'teaching' creativity is a life-long endeavor. The emphasis of innovation and education must be

continually fostered in an always learning environment. Leaders in the military should recognize their own and institutional practices as enablers to innovation. Pre-commissioning, ROTC, OCS/OTS, company grade PME, Intermediate Service Schools and Senior Service Schools each have the responsibility to educate. Education is not enough; however, Dr. Leonard Wong stated we must have a "culture of innovation" based on risk taking and creative thinking.

The results of the two 'Creative Thinking' surveys clearly demonstrate that strategic leaders have a great potential for altering their paradigms and thinking creatively. The results of the second survey show that the group, and the large majority of individuals, approached their task in creative ways. When individuals realized that they were free to approach the problem set creatively, they did so.

We cannot *demand* creativity of our subordinates or ourselves. A senior strategic leader certainly can't issue an order "You will be more creative". Instead we need to loosen our idea as to how we think things routinely operate. Dr. Wong calls for a cultural change in Army senior leaders. In his monograph Stifling Innovation: Developing Tomorrow's Leaders Today, Wong suggests that "senior leaders do less, not more" in order to foster a culture of innovation. As leaders, we need to ensure an appropriate environment. A successful environment for innovation and creativity will "demand *a* solution, not *the* solution".[20]

Although many popular descriptions for fostering creative cultures were designed with corporate situations in mind, they have applicability to military and government environments. I believe that there are six elements to fostering the 'right' environment to spark creativity:

1. be a risk taker
2. set high but reasonable goals
3. seek out innovative thinkers
4. accept mistakes
5. reward success / tolerate failure
6. provide personal recognition for accomplishments

These actions may at first glance appear to be no more than effective management; however, they are more than that. These are the qualities of a strong leader. This is empowered, innovative leadership at the point of the spear - leadership that is required to succeed in the 21st century.

All the creative ideas in the world will get you nowhere. The culmination of synthesizing creative ideas is in their actual implementation. After all, it is only when we apply our creative

'juices' to a problem and devise a concrete implementation are we successful. Ideas do not implement themselves; they must have the appropriate follow-through. A successful strategic leader gets things done by transforming creative ideas into innovative solutions.

The results of the set of creative thinking surveys support current literature and provide evidence that creativity can be increased. The strategic leaders who completed both surveys clearly demonstrated that they initially restricted themselves to their set paradigms. The relatively low number of innovative solutions presented to the first set of problems demonstrates a conservative nature. After the survey participants were exposed to non-traditional answers, they were greatly inclined to more carefully read the questions, and answer with creative or literal solutions as appropriate. The respondent's mental models of what were permissible answers was revised. Self-restrictions were removed and the resulting answers clearly demonstrated creative thinking.

Word count = 6,856

ENDNOTES

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